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# Systematic review of health and behavioural outcomes of smoking cessation interventions in prisons

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## ABSTRACT

**Objective** We conducted a systematic review to examine the impact of smoking cessation interventions, including smoking bans, on prisoners and prison staff.

**Data sources** We systematically searched health and criminal justice databases for relevant studies. Search strings were used to combine terms related to smoking cessation interventions with terms related to incarceration. We used forward and backward snowballing to capture additional studies.

**Study selection** Studies were included if: they were published between 1 January 1994 and 23 May 2016; the population was incarcerated adults and/or prison staff; they had a quantitative component; they were published in English; and they reported outcomes of a smoking cessation programme/ban with regard to reported change in smoking behaviour and/or behavioural outcomes.

**Data extraction** Studies were reviewed for methodological rigour using the Effective Public Health Practice Project's Quality Assessment Tool for Quantitative Studies. Data were independently reviewed for methodological quality by 1 author and a research assistant.

**Data synthesis** Cessation programmes, including free nicotine replacement therapy and/or behavioural counselling can significantly increase the likelihood of quitting in prison and increase abstinence postrelease. Indoor bans have little impact on prisoner smoking behaviour. Prisoners who experience a complete smoking ban typically resume smoking shortly after release from prison. Bans may result in adverse behavioural outcomes, but these are generally minimal and short-lived.

**Conclusions** While there is limited evidence to inform tobacco control policies in custodial settings, outcomes of this review suggest that cessation programmes/bans can be an effective mechanism to interrupt prisoner smoking behaviour when properly enforced.

## INTRODUCTION

Smoking is a significant public health issue, killing ~6 million people per year worldwide.<sup>1</sup> There is now clear evidence that the negative health consequences associated with smoking can be mitigated if smokers stop.<sup>2-3</sup> In recent decades, a significant reduction in smoking among the general population in the USA and Australia has led these countries to be considered two of the world's most successful smoking control nations.<sup>4</sup> Unfortunately, this trend has not been reflected in disadvantaged populations, with public health campaigns failing to meet the often complex needs of those living in poverty, suffering from mental illness or substance abuse disorders, and those involved in the criminal

justice system.<sup>5</sup> Despite stubbornly high rates of smoking and related health burden in vulnerable populations, they have received comparatively limited research attention.<sup>6</sup> This is particularly the case for prisoners.

Smoking rates among prisoners in the USA and Australia are, respectively, three and five times higher than in the general community.<sup>7</sup> Tobacco use is well entrenched in many prisoners' lives before they are incarcerated. In Australia, despite approximately half of all prison entrants who smoke expressing a desire to quit,<sup>7</sup> the stress of the prison environment, high rates of addiction and tobacco's embedded role in prison culture can make it difficult to stop.<sup>8</sup> In fact, the prison environment often perpetuates smoking behaviour, with almost half of those who smoke prior to imprisonment increasing their tobacco intake while incarcerated.<sup>7</sup> Furthermore, ~1 in 14 prisoners starts smoking in prison.<sup>7</sup> The prevalence of tobacco smoking is also high in prison staff.<sup>9</sup>

Research suggests that prisoners who smoke have high rates of comorbidity.<sup>7 10 11</sup> In Australia, mortality rates from smoking-related cancers for people who had been imprisoned are double that of the general population.<sup>12</sup> Non-smoking prisoners, staff and visitors are also affected by smoking-related illnesses through exposure to secondhand smoke (SHS).<sup>13 14</sup> These serious health risks in prison settings increase the threat of litigation. In 1993, the US Supreme Court found that exposure to SHS violated prisoners' eighth amendment rights, constituting cruel and unusual punishment. This landmark ruling triggered a number of American prisons to become smoke-free or at least implement indoor smoking bans,<sup>15</sup> strategies that have been shown to reduce exposure to SHS by improving air quality within prison grounds.<sup>16-21</sup> Smoking bans in prison have since gained popularity in Canada,<sup>22</sup> New Zealand<sup>23</sup> and Australia.<sup>24</sup>

While the potential health gains are significant,<sup>15</sup> there is little consensus on the effectiveness of smoking bans and cessation programmes on smoking behaviour either in prison or postrelease, resulting in a lack of best practice smoking intervention guidelines for the prison setting. There is also limited evidence regarding the impact of bans on other prisoner behaviours (eg, aggression). In this paper, we report the results of a systematic review of studies that focus on cessation and behavioural outcomes of prison smoking cessation interventions for prisoners and prison staff. In addition, we identify gaps in the literature and consider implications for research, policy and practice.



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## METHODS

This review followed PRISMA guidelines.<sup>25</sup>

### Data extraction

We used a metasearch engine ('Summon'), available through our institutional library, to systematically search 102 health databases and 205 criminology and law databases, including MEDLINE, EMBASE, Cochrane Library, PsycINFO, CINAHL, ProQuest and Science Direct. A metasearch engine is 'a federated search tool that supports unified access to multiple search systems', and is ideal for conducting systematic reviews.<sup>26</sup> We searched for studies published between 1 January 1994 (to capture studies published following the 1993 US Supreme Court ruling<sup>27</sup>) and 23 May 2016. Search strings pertained to the intervention and study population, and did not place any restriction on study design or outcome. The search string used was: (((smoking cessation) OR (smoking intervention) OR (smoking ban) OR (anti-smoking) OR (tobacco control)) AND ((jail) OR (prison\*) OR (incarcerat\*) OR (inmate\*) OR (custod\*) OR (detaine\*) OR (detention) OR (gaol))). The search was limited to title and abstract and included journal articles, dissertations and grey literature such as reports and government documents. Five prominent journals, namely Nicotine and Tobacco Research, Tobacco Control, Addiction, Journal of Correctional Health Care and the International Journal of Prisoner Health, were also manually screened for relevant articles. We used the backward snowballing technique to find new papers by searching the reference lists of included articles. We also use the forward snowballing technique, which involved identifying new articles by examining those that cited included papers.<sup>28</sup>

### Inclusion and exclusion criteria

Studies were included if: they were published between 1 January 1994 and 23 May 2016; the population was incarcerated adults and/or prison staff; they reported outcomes of original research on either a smoking cessation programme or a smoking ban (complete or partial); and they reported at least one of the following outcomes: (1) change in smoking behaviour (including cessation/abstinence), or (2) behavioural outcomes attributed to the programme or ban. Studies were excluded if: the cessation programme was part of a multicomponent health intervention; there were no human participants; participants were juveniles; there was no quantitative component; or the study was not published in English.

### Methodological quality assessment

Methodological quality was assessed using the Effective Public Health Practice Project's (EPHPP) Quality Assessment Tool for Quantitative Studies,<sup>29</sup> a tool previously assessed as having high construct validity, content validity and inter-rater reliability.<sup>29</sup> Each study was rated as strong, moderate or weak on each of six criteria: selection bias, study design, confounders, blinding, data collection method and withdrawals. Consistent with standard practice,<sup>29</sup> an overall rating was given for each study. Studies with a 'strong' overall rating could not have a weak rating for any criterion. Those with a 'moderate' overall rating had one weak rating, and those with a 'weak' overall rating had two or more weak ratings. A 'not applicable' rating was given for the withdrawal criterion if the study did not allow for participants to be followed over time (eg, cross-sectional or retrospective studies). Methodological rigour was assessed independently by one author and a research assistant, and any discrepancies were resolved through discussion.

## RESULTS

### Search results

An initial search located 196 publications through database searching that met keyword search criteria, and a further three through forward and backward snowballing. Of these 199, 146 were excluded based on the title of the publication. Of the remaining 53, 25 publications were deemed ineligible based on abstract review, leaving 28 publications for a full-text review. Of these 28, 8 were excluded due to: the full text not being available in English (n=1); being a qualitative study (n=3); or not having human participants (n=4). Twenty publications were found to fit inclusion criteria after full-text review. All were peer-reviewed journal articles. Thirteen of these articles (65%) were published since 2010. The publication retrieval process is detailed in figure 1.

Included studies were conducted in the USA (9), Australia (3), Canada (2), Greece (1), India (1), Iran (1), Switzerland (1), Turkey (1) and the UK (1). Two studies measured outcomes for female prisoners,<sup>30</sup> 11 measured outcomes for male prisoners,<sup>8 31-41</sup> 1 did not specify the sex of the prisoners<sup>42</sup> and 6 measured outcomes for a mixed sample (male and female prisoners, and/or staff).<sup>43-48</sup> No studies measured outcomes only for staff. Prisoners were offered free nicotine replacement therapy (NRT) in six studies<sup>8 30 33 35 38 43</sup> and had the option to purchase NRT in a further three studies.<sup>34 45 48</sup> The remaining studies did not discuss whether cessation support was offered to prisoners or staff under a complete or partial ban.

Our review of cessation and behavioural outcomes is presented in three substantive areas. Ten studies evaluated a smoking cessation programme, or an element of the programme.<sup>8 30 33 35-38 43 44 48</sup> Three studies evaluated an indoor smoking ban whereby smoking was limited to outdoor areas for prisoners and staff, with an aim to reduce SHS and improve air quality.<sup>39 45 46</sup> Seven studies examined a complete prisoner smoking ban, prohibiting smoking within the facility grounds for prisoners (and in some cases staff) with a focus on cessation and/or reporting other behavioural impacts of smoking bans.<sup>24 31 32 39-42</sup> In line with Valentine *et al's* recommendations,<sup>49</sup> a meta-analysis was not conducted as the few studies available of high methodological quality were heterogeneous in focus and methods.

### Methodological quality

Of the 20 studies summarised in table 1, 3 were given a strong methodological rating. Two of these studies were randomised controlled trials (RCTs) of smoking cessation programmes,<sup>33 38</sup> while the third was an RCT of a prerelease smoking abstinence programme in a prison with a complete smoking ban.<sup>44</sup> With the exception of one cross-sectional survey,<sup>32</sup> all other studies (n=15) were pre-post designs, with three of these involving different samples for pre and post measures.<sup>40 45 47</sup> Five studies were of moderate methodological quality,<sup>24 30 34 37 39</sup> and the remaining 12 studies (60% of all studies) were rated methodologically weak.<sup>8 32 35 36 40-43 45 46 48</sup> Common limitations that reduced quality included high attrition rates, lack of blinding in RCTs and reliance on self-report data with regard to smoking behaviour. A number of studies also required participants to have sufficient time left to serve in prison for a prison-based follow-up, leading to selection bias.

### Cessation outcomes

Cessation outcomes of smoking cessation programmes, indoor smoking bans and complete smoking bans in prison are

Figure 1 PRISMA flow diagram.

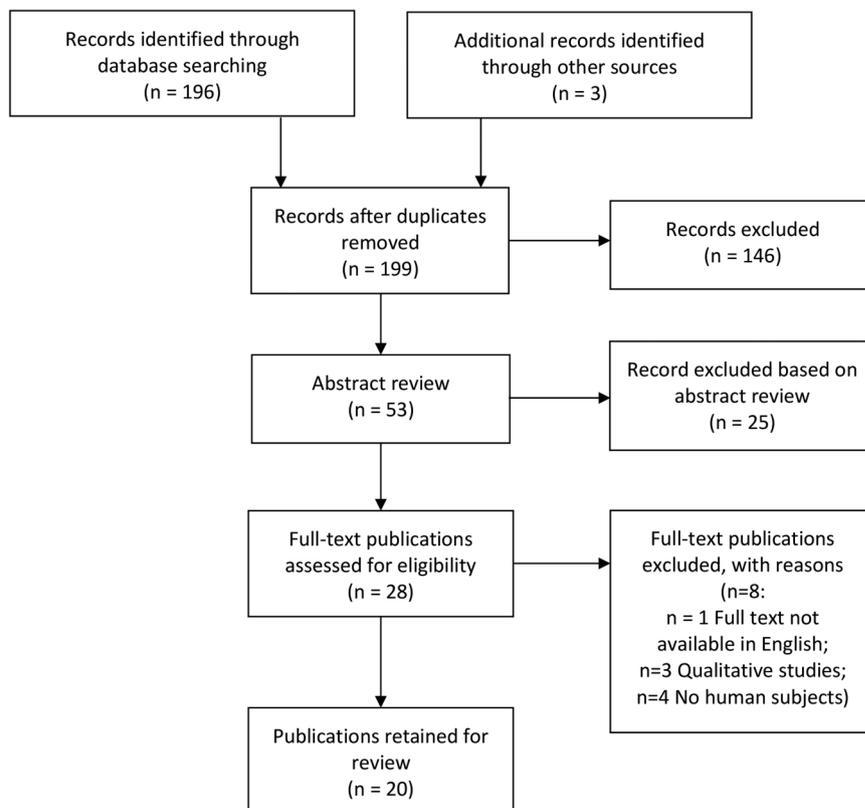


Table 1 Methodological quality of included studies

Study	Selection bias	Study design	Confounders	Blinding	Data collection	Withdrawals	Global rating
1 Awofeso <i>et al</i> , 2001 <sup>43</sup>	Weak	Weak	Weak	Weak	Weak	Strong	Weak
2 Clarke <i>et al</i> , 2013 <sup>44</sup>	Strong	Strong	Strong	Moderate	Strong	Strong	Strong
3 Cropsey and Kristeller, 2005 <sup>31</sup>	Moderate	Moderate	Weak	NA	Strong	Moderate	Moderate
4 Cropsey <i>et al</i> , 2008 <sup>30</sup>	Moderate	Strong	Strong	Weak	Strong	Moderate	Moderate
5 Etter <i>et al</i> , 2012 <sup>45</sup>	Weak	Weak	Weak	NA	Weak	Weak	Weak
6 Howell <i>et al</i> , 2015 <sup>32</sup>	Weak	Moderate	Weak	NA	Moderate	NA	Weak
7 Jalali <i>et al</i> , 2015 <sup>33</sup>	Moderate	Strong	Moderate	Strong	Strong	Strong	Strong
8 Kauffman <i>et al</i> , 2011 <sup>34</sup>	Moderate	Moderate	Weak	NA	Strong	NA	Moderate
9 Lasnier <i>et al</i> , 2011 <sup>46</sup>	Weak	Weak	Weak	NA	Weak	NA	Weak
10 Leone and Kinkade, 1994 <sup>47</sup>	Weak	Weak	Weak	NA	Moderate	NA	Weak
11 Lincoln <i>et al</i> , 2009 <sup>42</sup>	Weak	Moderate	Weak	NA	Moderate	Weak	Weak
12 MacAskill <i>et al</i> , 2008 <sup>35</sup>	Weak	Weak	Weak	NA	Moderate	Strong	Weak
13 Makris <i>et al</i> , 2012 <sup>36</sup>	Weak	Weak	Weak	NA	Moderate	Strong	Weak
14 Naik <i>et al</i> , 2014 <sup>37</sup>	Moderate	Strong	Moderate	Weak	Strong	Strong	Moderate
15 Richmond <i>et al</i> , 2006 <sup>8</sup>	Strong	Moderate	Weak	Weak	Strong	Strong	Weak
16 Richmond <i>et al</i> , 2013 <sup>38</sup>	Strong	Strong	Strong	Strong	Strong	Strong	Strong
17 Thibodeau <i>et al</i> , 2010 <sup>39</sup>	Moderate	Moderate	Weak	NA	Strong	Strong	Moderate
18 Turan and Turan, 2016 <sup>48</sup>	Strong	Weak	Weak	NA	Weak	Weak	Weak
19 Turner <i>et al</i> , 2013 <sup>40</sup>	Moderate	Weak	Moderate	NA	Weak	NA	Weak
20 Voglewede and Noel, 2004 <sup>41</sup>	Weak	Weak	Weak	NA	Strong	NA	Weak

NA, not applicable.

discussed below and summarised in table 2 (with more detail provided for each study in the online supplementary table).

#### Smoking cessation programmes

Ten studies evaluated the effectiveness of prisoner smoking cessation programmes or interventions. These included five RCTs—three of which had strong methodological quality

ratings,<sup>33 38 44</sup> while two were rated as moderate quality.<sup>30 37</sup> The lack of a control or comparison group contributed to the weak rating of the five remaining cohort studies.<sup>8 35 36 43 48</sup> Six interventions were targeted at male prisoners,<sup>8 33 35–38</sup> three at female and male prisoners<sup>43 44 48</sup> and one at female prisoners.<sup>30</sup> Only one intervention was designed for prisoners and staff.<sup>48</sup> With the exception of one study<sup>44</sup> for which follow-ups were

**Table 2** Summary of outcomes of included studies

Study	Outcomes	
	Cessation	Behavioural
1 Awofeso <i>et al</i> , 2001 <sup>43</sup>	+	NA
2 Clarke <i>et al</i> , 2013 <sup>44</sup>	+	NA
3 Cropsey and Kristeller, 2005 <sup>31</sup>	N	–
4 Cropsey <i>et al</i> , 2008 <sup>30</sup>	+	NA
5 Etter <i>et al</i> , 2012 <sup>45</sup>	+ and –	NA
6 Howell <i>et al</i> , 2015 <sup>32</sup>	N	NA
7 Jalali <i>et al</i> , 2015 <sup>33</sup>	+	NA
8 Kauffman <i>et al</i> , 2011 <sup>34</sup>	+ and –	–
9 Lasnier <i>et al</i> , 2011 <sup>46</sup>	+	–
10 Leone and Kinkade, 1994 <sup>47</sup>	N	–
11 Lincoln <i>et al</i> , 2009 <sup>42</sup>	+	NA
12 MacAskill <i>et al</i> , 2008 <sup>35</sup>	+	–
13 Makris <i>et al</i> , 2012 <sup>36</sup>	+	NA
14 Naik <i>et al</i> , 2014 <sup>37</sup>	+	NA
15 Richmond <i>et al</i> , 2006 <sup>8</sup>	+	NA
16 Richmond <i>et al</i> , 2013 <sup>38</sup>	+ (short term)	NA
17 Thibodeau <i>et al</i> , 2010 <sup>39</sup>	+	NA
18 Turan and Turan 2016 <sup>48</sup>	–	NA
19 Turner <i>et al</i> 2013 <sup>40</sup>	NA	+
20 Voglewede and Noel 2004 <sup>41</sup>	NA	NA

NA, not applicable.  
+, positive effect.  
–, negative effect.  
N, no effect.

postrelease (3 weeks and 3 months), participant follow-ups occurred in prison at a minimum of 4 weeks and a maximum of 12 months after baseline.

Participants in all studies except one<sup>48</sup> were prisoners with a desire to quit, and were provided with motivational interviewing (MI)<sup>37</sup> and/or cognitive-behaviour therapy (CBT),<sup>30 44</sup> pharmacological support such as NRT<sup>43</sup> or a multicomponent cessation programme consisting of counselling therapy and pharmacotherapy (NRT, varenicline, nortriptyline and/or bupropion).<sup>8 33 35–36 38 48</sup> Pharmaceuticals were provided free of charge to participants in all studies except one<sup>48</sup> that required participants with moderate to high addiction to purchase their own NRT, bupropion or varenicline (as prescribed by the study physician). Only 2 of 179 participants in this study purchased pharmaceuticals; both took them infrequently and continued to smoke.

Two studies<sup>33 37</sup> focused on reductions in cigarettes smoked per day and mean expired carbon monoxide (CO) readings rather than abstinence. The first of these studies<sup>37</sup> was an RCT of MI with Indian male prisoners. An immediate, significant reduction was observed in the intervention group's daily smoking ( $p < 0.001$ ) and expired CO readings ( $p < 0.001$ ). Expired CO readings were significantly lower for the intervention group than the control group at the 6-month follow-up ( $p < 0.001$ ); however, the number of cigarettes smoked per day was not significantly different ( $p = 0.92$ ). Similarly, the second of these studies<sup>33</sup> on Iranian male prisoners found that MI over 5 weeks significantly reduced expired CO readings (pre-post and control group comparison). However, the effect of combined MI and NRT was significantly greater than that of MI alone ( $p = 0.001$ ). The number of cigarettes smoked per day also decreased significantly (pre-post) for the two interventions groups ( $p = 0.02$ ). A reduction in the number of cigarettes

smoked per day among those relapsed was a significant secondary outcome for two other studies.<sup>8 43</sup>

For seven studies reporting prison-based follow-up, the primary outcome was abstinence: continuous,<sup>36 38 44 45</sup> point prevalent<sup>30 35</sup> or both.<sup>8</sup> Four studies reported short-term abstinence rates. One study collected abstinence (point prevalent) rates at 1-month follow-up.<sup>35</sup> In this study, the rate of abstinence after a group intervention across three prisons ranged from 58% to 82%, while the rate of abstinence after a one-on-one intervention across two prisons was 25% and 40%. Three studies<sup>30 36 38</sup> reported 3-month follow-up abstinence rates of between 16% (continuous) and 31% (continuous).<sup>36</sup>

Six studies measured long-term abstinence rates at 6-month and 12-month follow-ups. Five studies collected abstinence rates at a 6-month follow-up, with continuous rates being between 12%<sup>38</sup> and 22%,<sup>8</sup> and point prevalent rates being 14%<sup>30</sup> and 26%.<sup>8</sup> Only one of these studies reported a follow-up point prevalent abstinence rate for a control group (2.8%).<sup>30</sup> This rate was significantly lower than in the intervention group for the study ( $p = 0.001$ ) and any of the other five smoking cessation programmes' 6-month follow-up rates. Three studies reported 12-month follow-up abstinence rates of between 12% (point prevalent)<sup>30</sup> and 20% (continuous).<sup>36</sup>

Only one study<sup>44</sup> focused on extending the health benefits of forced abstinence (as part of a complete ban) postrelease. Participants were provided with 6 weeks of MI and CBT pre-release, as well as two brief telephone sessions postrelease. At 3 weeks postrelease, 25% of the intervention group had achieved continuous abstinence compared with 7.2% of the control group ( $p < 0.01$ ). At 3 months, 12% of the intervention group and 2.4% of the control group were continuously abstinent.

#### Indoor (partial) smoking bans

Three studies evaluated the cessation outcomes of an indoor smoking ban, with one study being rated moderate quality,<sup>48</sup> and the other two studies being considered of weak quality.<sup>45 46</sup> In the two methodologically weak studies,<sup>45 46</sup> prisoners and staff<sup>45</sup> were surveyed on their perceptions of air quality change following an indoor ban, and generally believed that SHS exposure had reduced. All three studies reported on smoking behaviour under an indoor prison smoking ban. While one study<sup>45</sup> reported no significant change to prisoner smoking behaviour postban, the remaining two studies<sup>34 46</sup> found that when prisoners still have access to tobacco (ie, indoor bans), many will breach prison rules with 51% and 93% of prisoners (respectively) continuing to smoke indoors following the ban. According to authors, this was largely due to smokers among prison staff not enforcing the ban.<sup>34 46</sup> Despite these negative outcomes, these studies found a significant reduction in the average number of cigarettes smoked per day compared with preban<sup>46</sup> and preadmission consumption.<sup>48</sup> In one study, participants also reported perceived improvements in overall health.<sup>46</sup>

#### Complete smoking bans

We identified seven studies on complete prison smoking bans, all conducted in the USA. While there was significant diversity in the focus of these studies, five examined the impact of a complete ban on smoking intent or smoking behaviour. Intention to smoke on release in ex-smoking male prisoners in a smoke-free prison was found to predict desire to smoke ( $p < 0.001$ ).<sup>41</sup> In another US study,<sup>39</sup> pre-release smoking intent predicted post-release smoking behaviour ( $p < 0.001$ ). Three US cohort studies examined smoking resumption following release from a smoke-

free prison where no cessation or prerelease support was provided.<sup>32 39 42</sup> While abstinence rates and follow-up time varied significantly, all observed significant reductions in smoking rates in the short term. One study in which participants had high comorbidity rates and a short average incarceration time of 2 months reported a continuous abstinence rate 1-month postrelease of 13.7% for smokers.<sup>42</sup> In a healthier sample with a much longer average incarceration time of 2.3 years, the 1-month abstinence rate (unknown if continuous) postrelease was 61%.<sup>39</sup> Similarly, 74% of ex-prisoners in the third study resumed smoking postrelease, with time since release being a minimum of 3 months and a maximum 12 months.<sup>32</sup> Only one study reported on cessation failure rate, with 76% of male prisoners continuing to smoke 1-month after the ban implementation.<sup>31</sup> High continued rates of smoking were partially attributed to a lack of staff support and enforcement of the ban.<sup>31</sup>

### Behavioural outcomes

Only one study<sup>47</sup> investigated changes in aggressive behaviour among prisoners following the introduction of a complete smoking ban with cessation support. Results showed that a complete smoking ban was associated with an increase in prisoner-on-prisoner assaults without injury ( $p < 0.001$ ) and prisoner-on-staff assaults without injury ( $p < 0.05$ ). The same study investigated the impact of the ban on staff health, finding no significant difference in the number of staff sick days taken before and after the ban was introduced. This study also found no statistically significant impact of a smoking ban on attempted or completed prisoner suicide.

Three studies reported on a change in currency or the development of black markets following the introduction of a smoking cessation programme<sup>35</sup> or indoor ban,<sup>46</sup> or complete ban.<sup>40</sup> The first study reported the development of a black market for nicotine patches as an unintended consequence.<sup>35</sup> The second study reported on the outcomes of an indoor smoking ban, in three prisons (male and female) where prisoners were limited in the number of cigarettes they could purchase per week. The mean self-reported number of cigarettes smoked per day far exceeded these limits, suggesting a cigarette black market.<sup>46</sup> The third study found a significant decrease in the number of prisoners who gambled following the introduction of a complete smoking ban in a federal prison.<sup>40</sup> This was due to the inability to use tobacco as a form of currency. Behavioural outcomes for each study are summarised in [table 2](#) (with further detail provided for each study in the online supplementary material).

### DISCUSSION

Our systematic review of 20 studies found that a complete smoking ban (rather than partial ban) can effectively interrupt smoking behaviour, and smoking cessation programmes (particularly multicomponent programmes) can increase the likelihood of abstinence in prison environments where tobacco is still available. Despite a very high prevalence of smoking in prisoners and resumption of smoking postrelease from smoke-free prisons, there are few studies of smoking cessation in prisoners (particularly including follow-up postrelease), and most are methodologically weak. At present, there are only five RCTs internationally of smoking cessation programmes for prisoners, and in all five cases, participants were willing participants who had a desire to quit. We found no studies evaluating complete smoking bans in which all prisoners were provided with access to free pharmacological or behavioural cessation support (other

than basic counselling). Furthermore, while there is evidence that cessation programmes and smoking bans in prison reduce smoking, there is also some evidence that bans can have unintended consequences, including aggressive behaviour.

### Implications for policy and practice

Much of the literature reviewed emphasises the unique opportunity that imprisonment provides to significantly improve the health and life expectancy for this high-risk group. Ten studies involving the follow-up of a smoking cessation or abstinence programme demonstrated that such programmes in the prison setting can have a significant and immediate impact on smoking abstinence and/or frequency of smoking behaviour, particularly when pharmacological treatments are involved. These outcomes are similar to those found in the general population, for which group behaviour therapy and NRT use have been associated with high rates of cessation.<sup>50</sup> Furthermore, comprehensive indoor smoking bans in the community have coincided with moderate quit rates of between 12% and 38%.<sup>50</sup> A recent RCT in a psychiatric inpatient facility in the USA is also consistent with the findings of this review, showing that a brief intervention, including NRT and counselling, can lead to good cessation outcomes in this challenging setting.<sup>51</sup>

Unfortunately, prisoners are unlikely to use pharmacological treatments or to quit (despite many having a desire to do so), unless treatment is provided free of charge.<sup>8 30 33–35 38 43 45 48</sup> Despite the relative success of smoking cessation programmes in prison settings and the general cost-effectiveness of such programmes,<sup>52</sup> there were no studies that assessed cessation outcomes of a prison smoking ban that provided free cessation assistance. This may be due to the financial investment required to provide free NRT and/or behavioural therapy to all prisoners (and staff).<sup>53</sup>

In recent years, a number of correctional authorities in Australia have introduced complete smoking ban policies based on New Zealand Corrections' 2011 policy.<sup>23</sup> The introduction of these bans has followed Australian Cessation Support Guidelines,<sup>54</sup> offering free NRT to prisoners and staff, and access to a national quit telephone counselling service. While there is some evidence that this level of support may be welcomed by prisoners,<sup>34</sup> and potentially reduce adverse events, costs may be difficult to justify from a public health perspective when the effects are likely, for most, short-lived and not sustained postrelease.<sup>42</sup> Greater investment in efforts to sustain abstinence after release from prison may, in conjunction with prison smoking bans, increase the public health impact and cost-effectiveness of these initiatives.

### Implications for research

With only three studies receiving a strong rating for methodological quality, this review highlights some of the challenges of conducting high-quality research in prisons, and the need for researchers in the field to commit to more rigorous methodology in this setting. Given the restricted environment and congregate living circumstances, it can be difficult to prevent contamination—of the five RCTs, only one was blinded. One solution to this problem may be to conduct a cluster RCT (or step-wedged cluster RCT) across multiple sites. While this type of design is more logistically complex and resource intensive, cluster RCTs have been successfully used to evaluate other complex health interventions in prison settings.<sup>55</sup>

At present, much of the evaluation research on complete bans has been conducted in the USA, making it difficult to generalise findings across different prison settings, cultures, populations

and countries. Furthermore, this review did not consider matters of ban implementation process or fidelity, as these issues were rarely discussed in the included studies, despite their importance in informing best practice for the implementation of prison smoking bans. As complete bans are rolled out in other nations (eg, New Zealand and Australia), we expect to see more variation in the effect that different implementation approaches and prison settings have on cessation and behavioural outcomes.

Many of the identified studies suffered from selection bias. In pursuit of high retention at follow-up, some studies excluded prisoners who were expected to be released before this time. Prisoners serving shorter sentences are systematically different from those serving longer sentences (eg, they are on average younger).<sup>56</sup> Conversely, some studies did not impose an exclusion criterion relating to sentence length and, without community follow-up, suffered from high and biased attrition. Future studies should incorporate strategies to ensure follow-up of continuously incarcerated participants and those released from custody before follow-up. Retaining ex-prisoners in longitudinal, health-focused studies is challenging but not impossible.<sup>57</sup>

Although limited, findings from the six studies reporting other behavioural outcomes highlight the need for quality studies that investigate the consequences of smoking bans in prison beyond cessation and health. Such studies could better inform policy and ban implementation practices, and minimise any adverse consequences of smoking bans for prisoners and staff.

Despite many prison staff being smokers,<sup>9</sup> only three studies examined outcomes for prison staff. Our review highlights the need for further research on smoking ban outcomes for prison staff including their enforcement of, and conformity to the ban; staff-related incidents (including assaults by prisoners); and staff involvement in contraband movement. Such research may assist in the development of smoking cessation programmes and/or implementation of complete bans in a way that maximises staff support and compliance.

Finally, three studies examined the rate of smoking resumption following release from a smoke-free prison with no cessation support. Findings were inconsistent and it is difficult to draw any meaningful conclusions.<sup>32 39 42</sup> The only study to evaluate a prerelease intervention showed that this approach can have a significant impact on postrelease abstinence, although the majority of participants receiving this intervention had relapsed by 3 months postrelease.<sup>44</sup> There is a clear need for further research to identify effective strategies for reducing relapse to smoking after release from smoke-free prisons.

### Limitations

This review had four main limitations. First, the inclusion criteria for the review allowed for a diverse range of smoking cessation settings in prison, leading to extensive heterogeneity regarding the scope, treatment, sample and follow-up. This diversity made it difficult to identify trends among studies and precluded meta-analysis. Second, the exclusion criterion requiring English language publications was not optimal, but in practice led to the exclusion of only one study. Third, while the process of ban implementation is likely to significantly affect the outcome, implementation was not discussed as this was not addressed in most articles. Fourth, this review did not include studies in which tobacco cessation was part of a broader health intervention as this may further complicate the interpretation of outcomes. Search results suggest that this limitation did not have a significant impact as there were very few studies of this kind.

### CONCLUSION

Rigorous evaluation of the handful of high-quality programmes suggests that long-term smoking cessation can be achieved, in prison and postrelease, particularly with multicomponent strategies. Further research is required that uses: large samples to ensure adequate statistical power; unbiased sampling and effective strategies for maximising retention for those released from custody during follow-up; and rigorous evaluation designs (including appropriate randomised designs) to identify effective smoking cessation programmes for prisoners and prison staff across various international contexts.

### What this paper adds

- ▶ To the best of our knowledge, this is the first review to assess the effectiveness of smoking cessation interventions and bans on prisoners and prison staff.
- ▶ We found that behavioural and pharmacological interventions increased smoking cessation and improved other health outcomes. Adverse behavioural outcomes following the introduction of bans were typically short-lived and modest.
- ▶ The majority of studies were methodologically weak. Rigorous studies, including randomised trials with representative samples and good follow-up, are required before definitive conclusions regarding 'what works' to reduce smoking in (ex-)prisoners and prison staff can be drawn.

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